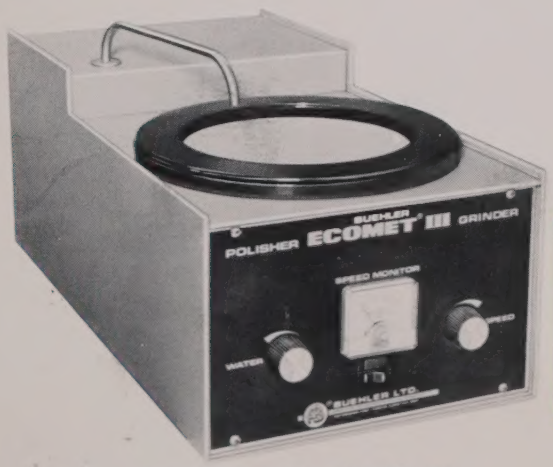
operating and maintenance instructions

49-1601 ECOMET® I

49-1602 ECOMET® II



49-1650 ECOMET® III

MP MASTER
MA35529

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BUEHLER
APPARATUS FOR MICROSTRUCTURAL ANALYSIS
41 WAUKEGAN ROAD • LAKE BLUFF, ILLINOIS USA 60044

WARRANTY

This unit is guaranteed against defective material and workmanship for a period of two (2) years from date of receipt by customer. Warranty is void if inspection shows evidence of abuse, misuse or unauthorized repair. Warranty covers only replacement of defective materials.

If, for any reason, this unit must be returned to our plant for warranty service, please apply for prior authorization with shipping instructions, and include the following information: Customer Purchase Order Number; Buehler Ltd. Invoice Number and Date; Serial Number; and reason for return.

ECOMET® I, II, and III POLISHER/GRINDERS

UNPACKING:

Carefully unpack and check contents. If any components are missing or damaged, save the packing list and material, and advise the carrier and Buehler Ltd. of the discrepancy. For your warranty protection and our permanent file, please complete and return the enclosed Equipment Registration Card.

ASSEMBLY:

General

ECOMET® Polishers are shipped assembled except for (refer to Figures 1, 2, or 3) Wheel (with Cloth Clamp and Paper Band, not shown), Splash Ring, Cover and breather plug (not shown). To assemble, remove pipe plug located on top of the Gear Box. Discard this plug and install breather plug (contained in envelope attached to the Spindle Nose). Place Wheel onto the Spindle Nose so that slot (not shown) in the wheel hub engages the key. Place Splash Ring into the Bowl. Attach and secure handle to top surface of the cover.

Samples

Included with each unit is a packet containing samples of PSA-backed Polishing Cloths and CARBIMET® Paper Discs. To reorder, consult the BUEHLER "ANALYST®" /Section 7. On ECOMET® I and II reordering information may be found on the front panel of the machine.

INSTALLATION:

Locate the ECOMET® Polisher/Grinder in a convenient place near a suitable electric outlet and near a drain or sink. ECOMET® II and III require cold water to supply the water faucet. This connection must be made with a ¼" OD Nylon tubing (not supplied) to the Bulkhead Fitting (Fig. 2 or 3). First loosen the hex nut of the fitting, cut tubing to length, then slip the end firmly into the hole. Hand tighten the nut; do not use a wrench. Drain connection can be made by attaching an adequate length 1" ID plastic or rubber hose to the Hose Coupling (Fig. 1, 2 or 3).

INDIVIDUAL ECOMET® FEATURES

49-1601 ECOMET® I

ECOMET® I is a fixed speed Polisher/Grinder, operating at 350 RPM (290 at 50 Hz.) and is designed for manual polishing or for use with the 60-1528 WHIRLIMET® Attachment. This unit does not provide the convenience of a faucet assembly. Lubrication must be supplied from a wash bottle or by other external means.

49-1602 ECOMET® II

ECOMET® II is a fixed speed Polisher/Grinder, operating at 175 RPM (145 at 50 Hz.) with sufficient power to drive semi-automatic attachments such as the 60-1900 AUTOMET® or the 60-1528 WHIRLMET®. Water is supplied to the wheel by means of a faucet assembly and a water control knob located on the front panel.

49-1650 ECOMET® III

ECOMET® III is a variable speed Polisher/Grinder having sufficient power at all speeds to drive both semi-automatic polishing attachments. The wheel speed is set by means of the speed control knob at the right of the front panel and may be determined from the meter located on the front of the panel. To determine the speed multiply the meter reading by 500. At full scale (one on the meter), the output speed is 500 RPM. By design, ECOMET® III will maintain the pre-selected speed under all reasonable loads. The electronic power drive is protected by a current limiter. If the unit is loaded beyond design capacity, the current limiter will automatically reduce power to the motor. A reduction in the applied load will restore full power to the system. Water is supplied to the wheel from a faucet assembly and is controlled by a knob on the front panel.

OPERATION:

The ECOMET® Polisher/Grinders may be used to prepare metallographic, petrographic and ceramographic samples. The wheel speed and other data for each ECOMET® model are given in Table 1, Page 3. Detailed information on metallographic sample preparation, including specific data on abrasives, wheel coverings, and lubricants for various metals and alloys may be found in the "METAL DIGEST®" Volume 20, Nos. 2-3. Information on the preparation of petrographic and ceramographic samples for both reflected and transmitted light examination is available in "METAL DIGEST®" Volume 12/13, No. 1. Supplies for the ECOMET® and other Buehler Polishers are shown on pages 10, 11 and 12. A complete listing of abrasives, cloths, discs, and other supplies and accessories useful in sample preparation is available in the Buehler publication "Cutting, Grinding, Mounting and Polishing Supplies" also free upon request.

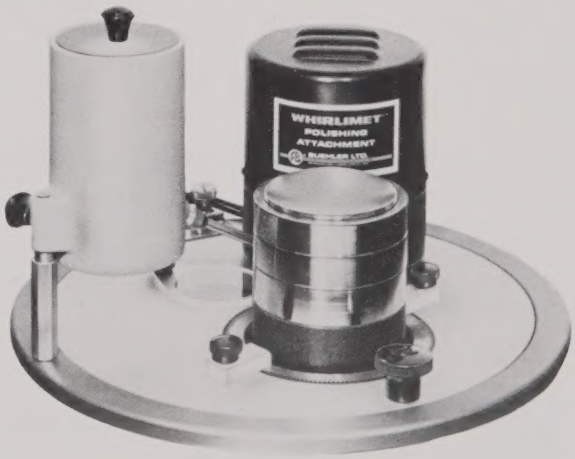
MAINTENANCE:

The Bowl, Splash Ring, Cover and Cabinet surfaces should be cleaned frequently and wiped dry. Lubrication of the Motor is not required. The Gear Box has been filled at the factory and should be checked at 6 month intervals. The oil should be maintained at a level with the Filler Holes in the front of Gear Box. If the oil is below this level, add a compounded oil containing 5 to 10 per cent acidless tallow having a viscosity (SUV seconds) of 125 to 150 at 210° F. (SAE 140). The lubricant should conform to American Gear Manufacturers Association (AGMA) Grade #7 compounded. To add oil, first disconnect electric source, then remove the Splash Ring and Wheel. Remove the vent breather plug on top of Gear Box for refilling to the recommended oil level. Replace both fittings and reassemble the Polisher. Reconnect electricity.

SEMI-AUTOMATIC ATTACHMENTS:

ECOMET® I will accept the WHIRLIMET® Attachment. ECOMETS® II and III are designed to accept both the WHIRLIMET® and AUTOMET® Attachments, increasing the sample output by preparing three or more specimens at a time. Uniform reproducible polishing is more easily achieved and less manual skill is needed to produce well-polished specimens. The operator is free for periods of time to perform other tasks. The WHIRLIMET® and AUTOMET® Attachments are shown below and at right with the following features noted:

The WHIRLIMET®



The WHIRLIMET® (60-1528) is a device which attaches to the polishing bowl by means of a mounting ring. The polishing mechanism is part of a hinged frame which may be opened to gain access to the polishing wheel for convenient wheel changing. Polishing is accomplished by the circular movement of three loosely held specimens, in a clockwise direction which is counter to the wheel rotation. Constant pressure is applied by adding appropriate amounts of weight. Standard specimen sizes, 1" (2.5cm), 1¼" (3.2cm), and 1½" (3.8cm) diameter and 27 x 46mm glass petrographic slides may be prepared using the WHIRLIMET® Attachment. This unit is particularly useful for rough and final polishing steps and in some fine grinding applications.

The AUTOMET®

The AUTOMET® (60-1900) attaches to the polishing wheel by means of a center post which fits into a special wheel having a threaded center hole. Three (3) to six (6) samples, depending on the mount size, are rigidly held by a specimen holder. The specimens are polished when the specimen holder, driven from the wheel center post, is moved counter to the wheel rotation. Variable pressure is applied by turning the pressure knob until the desired pressure is reached. The AUTOMET® Attachment is very useful in preparing most specimens through the fine grinding and the rough and final polishing steps.

Installation of Semi-automatic Attachments.

When attaching mounting rings, make sure the ring is as far down as possible before tightening the set screws. The bowl will be deflected outward against the metal cabinet, assuring positive torque resistance.

TABLE 1

ELECTRICAL & MECHANICAL DATA FOR ECOMET® I, II and III

ECOMET® MODEL	H.P.	MOTOR DATA			WHEEL RPM	WHEEL TYPE	RECOMMENDED APPLICATIONS
		VOLTS	PHASE/Hz.	FUSE AMP.*			
I	1/6	115	1/60	5.0	350	Non-Conductive	Manual Polishing and
	1/6	220	1/50	3.0	290	(40-4058)	WHIRLIMET® Attachment
II	1/3	115	1/60	8.0	175	Non-Conductive	Manual and Semiautomatic
	1/3	220	1/50	5.0	145	(40-4058)	Polishing—WHIRLIMET® and AUTOMET®
III	1/3	115	1/60	5.0	0-500	Non-Conductive	Manual and Semiautomatic
	1/3	220	1/50	3.0	0-500	(40-4058)	Polishing—WHIRLIMET® and AUTOMET®

*CHECK MACHINE DATA PLATE

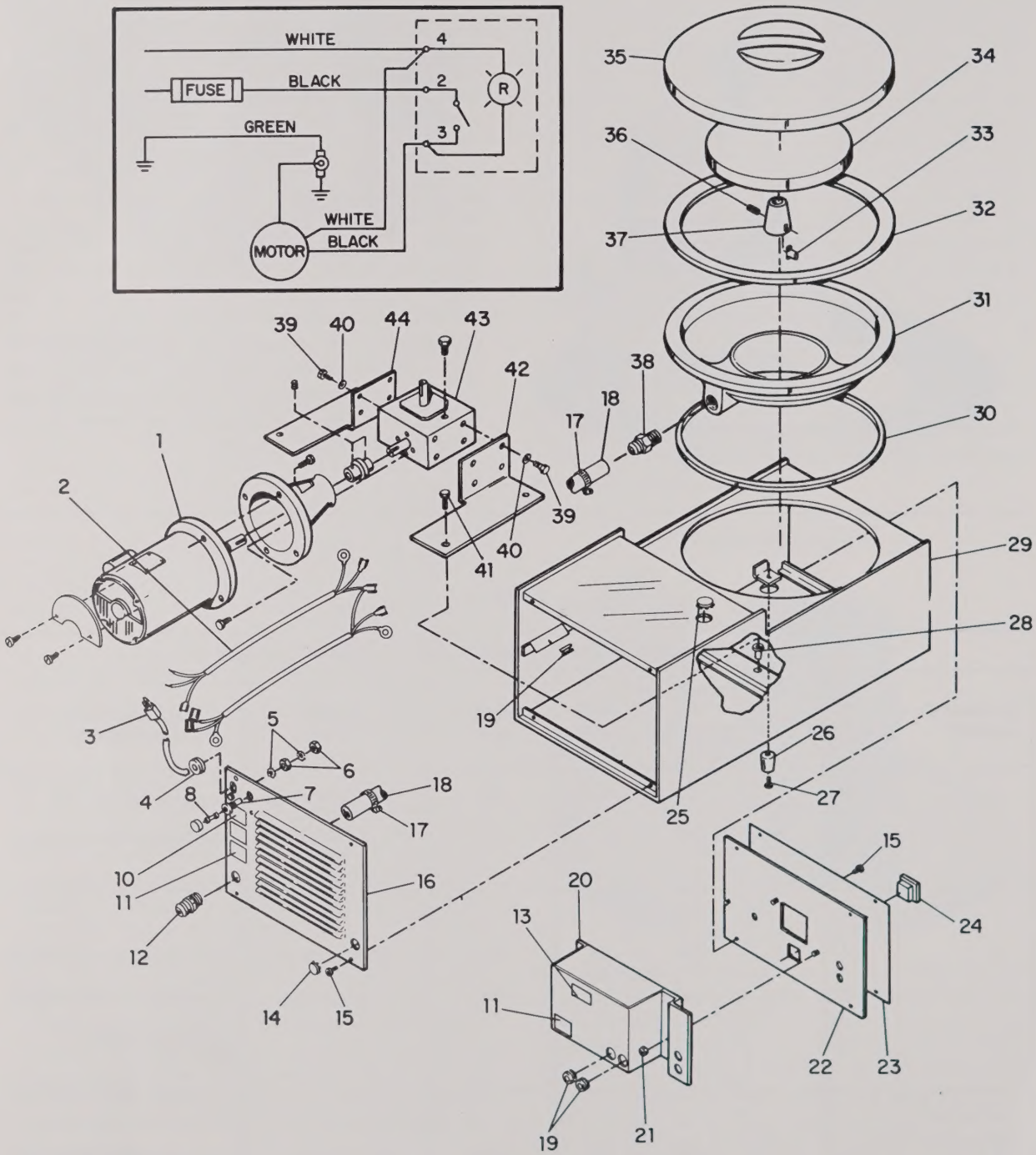


FIGURE 1. ECOMET® I ASSEMBLY DETAIL

ECOMET® I PARTS LIST

(Details of design are subject to change without notice.)

REF. NO.	PART NO.	QTY. REQ.	DESCRIPTION
1	1600-S065	1	Motor, 1/6 H.P., 100/115/220V/1/50-60 Hz.
2	1600-S022	1	Wiring Harness
3	R-0497A	1	Cord & Plug, 115V
	1600-S049	1	Cord Assembly, 220V
4	R-4535	1	Cord Bushing, 220V Model
	R-4536	1	Cord Bushing, 115V Model
5	R-0612LWE	2	Lockwasher, #10, Ext., SS
6	R-0612	2	Nut, #10-32, Hex, SS
7	1305-S17	1	Fuse Post
8	R-4550	1	Fuse, 3 Amp, 220V Model
	R-7764	1	Fuse, 5 Amp, 115V Model
9	Not used		
10	1670-S070	1	Fuse Plate
11	1790-S062	1	Warning Plate
12	R-4508	1	Hose Mender
13	1790-S062	1	Warning Plate
14	R-4537	1	Hole Plug
15	R-7605	9	Screw, #8-32 x 3/8", SS, Truss Type T
16	1600-S004	1	Back Panel
17	R-2744	2	SS Hose Clamp, H-16
18	1600-S037	1	Drain Hose
19	R-2714	3	Grommet, Alt. #1720
20	1600-S017	1	Switch Box
21	R-0607	3	Nut, #8-32, Hex, Brass
22	1600-S016	1	Front Panel
23	1600-S020	1	Nameplate, ECOMET® I
24	1600-S021	1	Switch with lamp
25	R-2786	1	Caplug
26	R-2702	4	Foot, #197
27	R-7608	4	Screw, #8-32 x 5/8", Cr. Pan Hd., SS, Type T.
28	1600-S015	4	Wellnut, 1/4-20
29	1600-S055	1	Cabinet—ECOMET®
30	1500-S11A1	1	Bowl Gasket
31	1600-S001	1	Bowl
32	40-2008	1	Splash Ring, 8", Plastic
33	1500-S015	1	Key
34	40-4058	1	Polishing Wheel, 8", Aluminum
35	40-2028	1	Cover, 8", Black
36	R-1293F	1	Set Screw, 1/4-28 x 3/8", SS
37	1500-S030	1	Spindle Nose—5/8" Bore
38	R-2891	1	Male Insert Adapter
39	R-2424	8	Screw, 5/16-18 x 3/4", Hex Hd., SS
40	R-0618LW	8	Lockwasher, 5/16", SS
41	R-2405	4	Screw, 1/4-20 x 1", Hex Hd., SS
42	1600-S056	1	Mounting Bracket, Left
43	1600-S058	1	Gear Box Assembly, 5.1 Ratio
44	1600-S057	1	Mounting Bracket, Right
NS	1010-S42AB	1	Vise Key

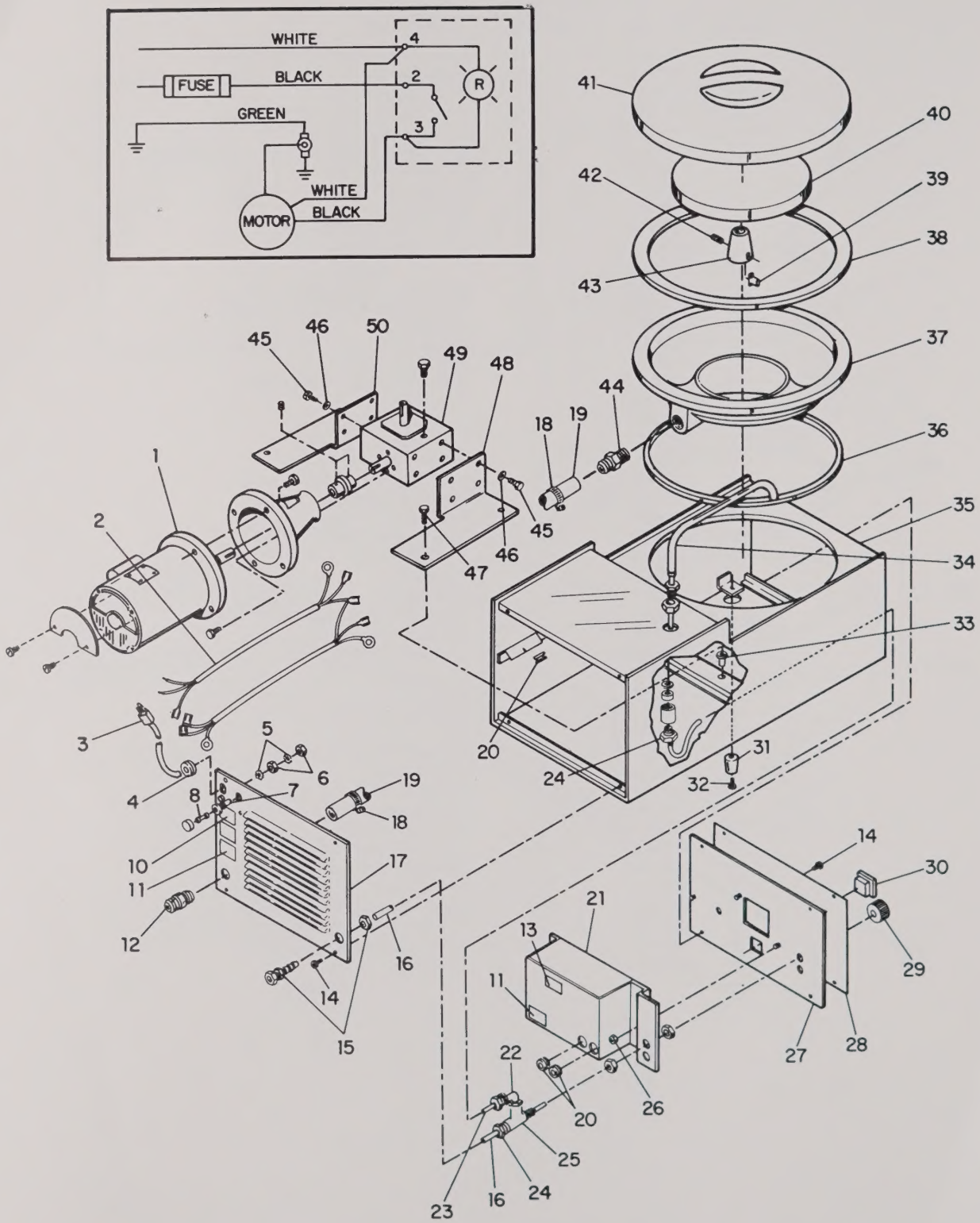


FIGURE 2. ECOMET® II ASSEMBLY DETAIL

ECOMET® II PARTS LIST

(Details of design are subject to change without notice.)

REF. NO.	PART NO.	QTY. REQ.	DESCRIPTION
1	1600-S068	1	Motor, 1/3 H.P., 100/115/220V/1/50-60 Hz.
2	1600-S022	1	Wiring Harness
3	R-0497A	1	Cord & Plug, 115V
	1600-S049	1	Cord Assembly, 220V
4	R-4535	1	Cord Bushing, 220V Model
	R-4536	1	Cord Bushing, 115V Model
5	R-0612LWE	2	Lockwasher, #10, Ext., SS
6	R-0612	2	Nut, #10-32, Hex, SS
7	1305-S17	1	Fuse Post
8	R-4554	1	Fuse, 8 Amp, 115V Model
	R-7764	1	Fuse, 5 Amp, 220V Model
9	Not used		
10	1851-S020	1	Fuse Plate
11	1790-S062	1	Warning Plate
12	R-4508	1	Hose Mender
13	1790-S062	1	Warning Plate
14	R-7605	9	Screw, #8-32 x 3/8", SS, Truss Type T
15	R-4511	1	Bulkhead Union, 1/4" Tube
16	1600-S039	1	Pressure Tube
17	1600-S004	1	Back Panel
18	R-2744	2	S.S. Hose Clamp, H-16
19	1600-S037	1	Drain Hose
20	R-2714	3	Grommet, Alt. #1720
21	1600-S017	1	Switch Box
22	R-4510	1	Male Elbow, 1/4 Tube—1/8 N.P.T.
23	1600-S038	1	Faucet Tube
24	R-4512	2	Male Connector, 1/4 Tube—1/8 N.P.T.
25	1600-S044	1	Valve
26	R-0607	3	Nut, #8-32, Hex, Brass
27	1600-S016	1	Front Panel
28	1600-S019	1	Nameplate, ECOMET® II
29	1330-S71	1	Knob
30	1600-S021	1	Switch with lamp
31	R-2702	4	Foot, #197
32	R-7608	4	Screw, #8-32 x 5/8", Cr. Pan Hd., SS, Type T.
33	1600-S015	4	Wellnut, 1/4-20
34	1600-S028	1	Faucet Assembly
35	1600-S055	1	Cabinet—ECOMET®
36	1500-S11A1	1	Bowl Gasket
37	1600-S001	1	Bowl
38	40-2008	1	Splash Ring, 8", Plastic
39	1500-S015	1	Key
40	40-4058	1	Polishing Wheel, 8", Aluminum
41	40-2028	1	Cover, 8", Black
42	R-1293F	1	Set Screw, 1/4-28 x 3/8", SS
43	1500-S030	1	Spindle Nose—5/8" Bore
44	R-2891	1	Male Insert Adapter
45	R-2424	8	Screw, 5/16-18 x 3/4", Hex Hd., SS
46	R-0618LW	8	Lockwasher, 5/16", SS
47	R-2405	4	Screw, 1/4-20 x 1", Hex Hd., SS
48	1600-S056	1	Mounting Bracket, Left
49	1600-S064	1	Gear Box Assembly, 10:1 Ratio
50	1600-S057	1	Mounting Bracket, Right
NS	1010-S42A8	1	Vise Key

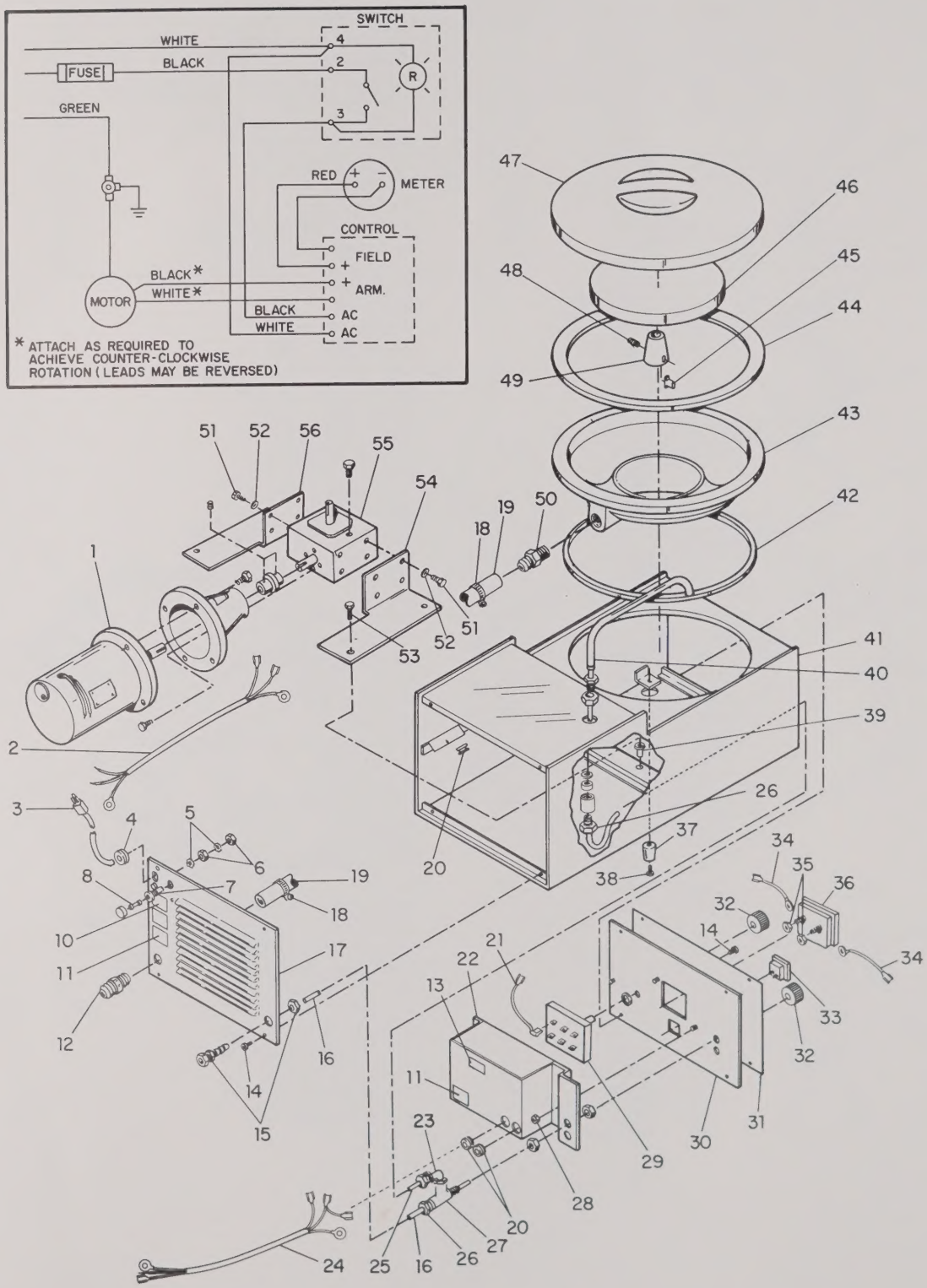


FIGURE 3. ECOMET® III ASSEMBLY DETAIL

ECOMET® III PARTS LIST

(Details of design are subject to change without notice.)

REF. NO.	PART NO.	QTY. REQ.	DESCRIPTION
1	1600-S060	1	Motor, D.C., 1/3 H.P., 90V
	1600-S061	1	Motor, D.C., 1/3 H.P., 180V
2	1600-S059	1	Motor Cable—ECOMET® III
3	R-0497A	1	Cord & Plug, 115V
	1600-S032	1	Wiring Harness for III, 220V
4	R-4535	1	Cord Bushing, 220V Model
	R-4536	1	Cord Bushing, 115V Model
5	R-0612LWE	2	Lockwasher, #10, Ext., SS
6	R-0612	2	Nut, #10-32, Hex, SS
7	1305-S17	1	Fuse Post
8	R-4550	1	Fuse, 3 Amp, 220V Model
	R-7764	1	Fuse, 5 Amp, 115V Model
9	Not used		
10	R-2852	1	Fuse Plate
11	1790-S062	1	Warning Plate
12	R-4508	1	Hose Mender
13	1790-S062	1	Warning Plate
14	R-7605	9	Screw, #8-32 x 3/8″, SS, Truss Type T
15	R-4511	1	Bulkhead Union, 1/4″ Tube
16	1600-S039	1	Pressure Tube
17	1600-S004	1	Back Panel
18	R-2744	2	SS Hose Clamp, H-16
19	1600-S037	1	Drain Hose
20	R-2714	3	Grommet, Alt. #1720
21	1600-S034	1	Power Jumper
22	1600-S017	1	Switch Box
23	R-4510	1	Male Elbow, 1/4 Tube—1/8 N.P.T.
24	1600-S030	1	Wiring Harness for III, 115V
25	1600-S038	1	Faucet Tube
26	R-4512	2	Male Connector, 1/4 Tube—1/8 N.P.T.
27	1600-S044	1	Valve
28	R-0607	3	Nut, #8-32, Hex, Brass
29	1600-S062	1	1/3 H.P., D.C. Control 115V/1ϕ
	1600-S063	1	1/3 H.P., D.C. Control 220V/1ϕ
30	1600-S016	1	Front Panel
31	1600-S018	1	Nameplate, ECOMET® III
32	1330-S71	2	Knob
33	1600-S021	1	Switch with lamp
34	1600-S035	2	Dial Jumper
35	R-0604	2	Nut, #6-32, Hex, Brass
36	R-4509	1	D.C. Milliammeter
37	R-2702	4	Foot, #197
38	R-7608	4	Screw, #8-32 x 5/8″, Cr. Pan Hd., SS, Type T.
39	1600-S015	4	Wellnut, 1/4-20
40	1600-S028	1	Faucet Assembly
41	1600-S055	1	Cabinet—ECOMET®
42	1500-S11A1	1	Bowl Gasket
43	1600-S001	1	Bowl
44	40-2008	1	Splash Ring, 8″, Plastic
45	1500-S015	1	Key
46	40-4058	1	Polishing Wheel, 8″, Aluminum
47	40-2028	1	Cover, 8″, Black
48	R-1293F	1	Set Screw, 1/4-28 x 3/8″, SS
49	1500-S030	1	Spindle Nose—5/8″ Bore
50	R-2891	1	Male Insert Adapter
51	R-2424	8	Screw, 5/16-18 x 3/4″, Hex Hd., SS
52	R-0618LW	8	Lockwasher, 5/16″, SS
53	R-2405	4	Screw, 1/4-20 x 1″, Hex Hd., SS
54	1600-S056	1	Mounting Bracket, Left
55	1600-S058	1	Gear Box Assembly, 5:1 Ratio
56	1600-S057	1	Mounting Bracket, Right
NS	1010-S42A8	1	Vise Key

SUPPLIES FOR ECOMET® AND OTHER BUEHLER POLISHERS:

GRINDING PAPER DISCS FOR 8" (20.3cm) GRINDERS

CARBIMET® DISCS 8" (20.3cm) Dia.			CARBIMET® PAPER DISCS FOR AUTOMET® 8" Dia. with 2½" Center Hole (20.3cm × 6.4cm)	
Grit	Plain Back	PSA Back	Grit	PSA Back
60	30-5108-060-100		120	30-5148-120-100
120	30-5108-120-100	30-5118-180-100	180	30-5148-180-100
180	30-5108-180-100	30-5118-180-100	240	30-5148-240-100
240	30-5108-240-100	30-5118-240-100	320	30-5148-320-100
320	30-5108-320-100	30-5118-320-100	400	30-5148-400-100
400	30-5108-400-100	30-5118-400-100	600	30-5148-600-100
600	30-5108-600-100	30-5118-600-100		
	(Packaged 100 Discs per Box)		(Packaged 100 Discs per Box)	

No. 30-5128 CARBIMET® PAPER DISCS, 8" (20.3cm) with PSA adhesive back, Packaged Ass't. 10 ea. Grit 240, 320, 400, 600, per Box.

POLISHING CLOTHS						
CLOTHS	6" (15.2cm) WHEEL	8" (20.3cm) WHEEL	8" x 2½" (20.3cm x 6.4cm) AUTOMET® & VIBROMET™	10" (25.4cm) WHEEL	12" (30.5cm) WHEEL	12" x 2½" (30.5cm x 6.4cm) VIBROMET™
SELVYT	40-7006	40-7008		40-7010	40-7012	
NYLON Plain Back	40-7056	40-7058		40-7060	40-7062	
Water Resistant Adhesive Back		40-7068	40-7078		40-7072	40-7082
METCLOTH®	40-7156	40-7158		40-7160	40-7162	
MICROCLOTH® Plain Back	40-7206	40-7208	40-7238	40-7240	40-7242	
Oil/Water Resistant Adhesive Back	40-7216	40-7218	40-7228	40-7220	40-7222	40-7232
BILLIARD CLOTH	40-7306	40-7308		40-7310	40-7312	
RED FELT	40-7356	40-7358		40-7360	40-7362	
SELECTED SILK	40-7406	40-7408		40-7410	40-7412	
RAYVEL®	40-7476	40-7478		40-7480	40-7482	
CANVAS	40-7506	40-7508		40-7510	40-7512	
KITTEN EAR™	40-7556	40-7558		40-7560	40-7562	
TEXMET® Oil/Water Resistant Adhesive Back	40-7616	40-7618	40-7628	40-7620	40-7622	40-7632
Perforated/ Chemically Activated Adhesive Back	40-7636	40-7638	40-7648	40-7640	40-7642	40-7652
MASTERTEX™ Oil/Water Resistant Adhesive Back		40-7738	40-7748		40-7742	40-7752
CHEMOMET® I Plain Back		40-7908			40-7912	
Oil/Water Resistant Adhesive Back		40-7918	40-7928		40-7922	*

All Buehler Cloths are available in other sizes on special requests

POLISHING MATERIALS	POWDERS				LIQUIDS
TYPE	NAME	8 oz. (0.23 Kg)	1 lb. (0.45 Kg)	5 lb. (2.3 Kg)	6 fl. oz. (0.18)
Aluminum Oxide (Al_2O_3)	MICROPOLISH® B 0.05 micron Gamma	40-6301-008	40-6301-016	40-6301-080	
	MICROPOLISH® A 0.3 micron Alpha	40-6305-008	40-6305-016	40-6305-080	
	MICROPOLISH® C 1.0 micron Alpha	40-6310-008	40-6310-016	40-6310-080	
	Levigated Alumina		40-6435-016	40-6435-080	
	Alpha MICROPOLISH® Alumina No. 1 5.0 micron				40-6351-006
	Alpha MICROPOLISH® Alumina No. 1C 1.0 micron				40-6354-006
	Alpha MICROPOLISH® Alumina No. 2A 0.3 micron				40-6352-006
	Gamma MICROPOLISH® Alumina No. 3B 0.05 micron				40-6353-006
New Deagglomerated Aluminum Oxide (Al_2O_3)	MICROPOLISH® II 1.0 micron	40-6321-008	40-6321-016	40-6321-080	
	MICROPOLISH® II 3.0 micron	40-6323-008	40-6323-016	40-6323-080	
	MICROPOLISH® II 0.05 micron	40-6325-008	40-6325-016	40-6325-080	
	MICROPOLISH® II 1.0 micron				40-6361-006
	MICROPOLISH® II 0.3 micron				40-6363-006
	MICROPOLISH® II 0.05 micron				40-6365-006
Cerium Oxide (Ce0)	MICROMET® 1.0 micron				40-6355-006
Chromic Oxide (Cr_2O_3)	Chrome Oxide 1-5 micron		40-6480-016.	40-6480-080	
	METPOLISH® No. 1 1.0 micron				40-6481-006
	METPOLISH® 0.5 micron				40-6482-006
Magnesium Oxide (Mg0)	MAGOMET®		40-6440-016		
Iron Oxide (Fe_2O_3)	Jewelers Rouge 3.0 micron		40-6445-016	40-6480-080	
Colloidal Silica (SiO_2)	MASTERMET™	Liquid, 0.5 Gal (1.9*l*)			40-6370-064

EXTENDERS FOR METADI®			
Cat. No.	Description	Cat. No.	Description
40-6004	METADI® Fluid 4 oz. (0.12*l*) with appl.	40-8142-032	Polishing Oil 32 oz. (0.95*l*)
40-6014	METADI® Fluid 4 oz. (0.12*l*) Refill	40-8142-128	Polishing Oil 1 gal. (3.8*l*)
40-6016	METADI® Fluid 16 oz. (0.47*l*) Refill	60-3250-006	AUTOMET® Lapping Oil 6 oz. (0.18*l*)
40-6032	METADI® Fluid 32 oz. (0.95*l*) Refill	60-3250-128	AUTOMET® Lapping Oil 1 gal. (3.8*l*)
40-3200	Atomizer Applicator for METADI® Fluid	60-3255	Applicator Bottle 8 oz. (0.24*l*)

METADI® DIAMOND COMPOUNDS					METADI® II DIAMOND COMPOUNDS			
PASTE		MICRON	COLOR	AEROSOL SPRAY	MICRON	COLOR	PASTE	
5 Grams	20 Grams			5 oz. (142 g)			5 Grams	20 Grams
40-6112	40-6102	¼ Medium	Gray	40-6260	¼	Gray	40-6241	40-6240
40-6132	40-6122	1 Medium	Blue	40-6264	1	Blue	40-6244	40-6243
40-6138	40-6128	1 Heavy	Blue					
40-6152	40-6142	3 Heavy	Green	40-6268	3	Green	40-6247	40-6246
40-6172	40-6162	6 Medium	Yellow	40-6272	6	Yellow	40-6250	40-6249
40-6192	40-6182	9 Heavy	Deep Red	40-6276	9	Deep Red	40-6253	40-6252
40-6212	40-6202	15 Heavy	Brown	40-6280	15	Brown	40-6256	40-6255
40-6222		30 Medium	Mahogany	40-6284	30	Mahogany	40-6258	
40-6232		45 Medium	Purple	40-6288	45	Purple	40-6259	

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